

opening is just large enough to admit an average-sized forefinger. This corresponds rather accurately with the size of the normal pylorus. The opening made with the suture method is always much larger than this; in most clinics the stoma is made large enough to admit easily two average-sized fingers. This means a very large difference when one takes into account the number of muscle and nerve bundles divided; with the button a small incision is made and the latter is then bluntly dilated sufficient to admit the button; with the suture much more than two fingers' breadth must be cut in order to allow for subsequent contraction. I am inclined to think that for this reason the functioning of a button stoma shows a nearer approach to the normal standard; its action more nearly approaches that of the pylorus.

Summary. Evidence is presented which seems to show that the functional result of a gastroenterostomy made with the aid of a Murphy button is superior to that of a gastroenterostomy made by the suture method.

THE MALE SEXUAL GLAND IN THE PREVENTION OF CREATINURIA.*

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THE perplexing problems of the origin and intermediary metabolism of creatin and the factors influencing its excretion have not been definitely solved, in spite of the mass of investigative work. Creatin is found normally in animal tissue, specially muscle, in the urine of children, and occasionally in the urine of normal women. Only under certain pathologic conditions, such as fasting, cachexia, febrile disease, hyperthyroidism, diabetes mellitus, myopathies and so forth does the adult male excrete creatin. "Since creatinuria disappears at puberty, and does not occur in normal man, a hitherto neglected factor for its excretion obtrudes itself, namely, the influence of the male sexual gland."

In order to determine the effect of castration on the creatin excretion of the rabbit, experiments initiated August 1, 1920, were carried out at the Sprague Memorial Hospital of Chicago, in conjunction with Dr. George H. Jackson, Jr. In some instances there was a pronounced increase of creatin excretion on the second day following castration, and possibly a slight persisting increase lasting forty-five days. These experiments were controlled by

* This work was undertaken at the suggestion of Dr. S. Amberg, to whom I wish to acknowledge helpful suggestions given during the course of the study.

similar experiments on rabbits in which the vas deferens was tied off. The results were only suggestive at best. Such experiments should be repeated on animals that normally do not excrete creatin, as the onset of creatinuria gives results more definite than a condition in which the normal amount of creatin is increased. Such conditions exist in man.

Beginning in February, 1921, we have had the opportunity in the Mayo Clinic of studying the creatin excretion of two eunuchs, three men with a congenital testicular defect and one man with a defect acquired at the age of twenty-seven years. We had completed the rabbit experiments, the observations on one eunuch, and on one person with a congenital testicular defect, when the very interesting paper of Read appeared. Having the same idea in mind, Read had studied the creatin excretion of the Chinese eunuch; he found that creatin was constantly present in the urine of eunuchs who had been castrated before the development of the secondary sex characteristics. His results are tabulated:

TABLE 1.

Excretion of

Eunuch.	Age.	Age at operation.	Nitrogen, gm.	Creatinin, per cent.	Creatin, per cent.
2	18	12	7.12	Trace	0.149
3	18	9	4.09	0.204	0.424
4	30	19	0.039	0.060
5	27	?	0.006	0.017
6	40	29	0.004	

The heading per cent, under which the creatinin and creatin values are given, we assume to mean total output in milligrams. The creatinin and creatin values are very remarkable. Read states that the absence of creatinuria in eunuch 6 is owing to the fact that castration was performed at the age of twenty-nine years, after the development of the secondary male characteristics. As the sexual maturity of the Chinese race is late, the infantile influence on creatin metabolism was still present in eunuch 4 at the time of castration performed as late as the nineteenth year. Therefore, he continued to excrete creatin for the same reason as eunuch 3, castrated at nine years.

In each of our six patients one specimen of urine was analyzed for creatin immediately after voiding; the results correspond with the subsequent determinations. The twenty-four-hour specimens of urine were collected in a bottle containing toluol and surrounded by ice. Folin's method was used for the determination of the creatinin and creatin and Folin's micro Kjeldahl method for the determination of the nitrogen. The patients were on a general diet, on which normal man does not excrete creatin.

REPORT OF CASES

CASE 1.—(A344023) H. E. B., aged thirty-one years, was unmarried. He had been in good health, and normal sexually, until February, 1918, when, following a therapeutic accident, it was necessary to remove completely the testicles, scrotum, and penis. His libido remained. The patient was muscular, and unusually fat around the face and neck; this had increased since castration. He was a blond, had very little hair on the body, but the normal amount on the head and face and in the armpits. He was treated for chronic granuloma in the region of the operation. The analysis of his urine is shown in Table 2.

TABLE 2.

March.	Nitrogen, gm.	Creatinin, mg.	Creatin, mg.
5	8.59	1169	124.3
6	13.8	1535	115.0
7	9.53	1352	59.0
8	9.68	1518	52.8
9	11.99	1412	53.8
11	12.09	1190	137.3

CASE 2.—(A354881) W. D. E., aged forty-two years, had been married eleven years and had not had children. Sexual incompetence and a minimum of libido had always existed. His build was of the feminine type, with broad pelvis, hypotonicity of the musculature, and an accumulation of fat in the breasts and buttocks. There was no hair on the body, a normal amount in the armpits, and a scant growth on the head and face. He said that there had been scarcely any change in his appearance during the past twenty years. The testicles were pea-sized; the penis was small. The basal metabolic rate was -15 per cent. The analysis of the urine is shown in Table 3.

TABLE 3.

	Nitrogen, gm.	Creatinin, mg.	Creatin. mg.
April.			
23 . .	.6.13	1221	117.6
24 . .	12.14	1446	98.6
26 . .	23.18	1699	339.9
27 . .	11.63	1428	140.0
Thyroid extract, 5 grains . .	28 . .	14.28	1500
Thyroid extract, 5 grains . .	29 . .	18.79	1433
	30 . .	7.59	1499
May			
	2 . .	11.55	1584
	3 . .	8.31	1397
			561.0
			479.4

CASE 3.—(A330908) C. H. H., aged thirty-nine years, had been married five years and had not had children. At the age of thirteen

the testicles had been swollen and painful for a short time. At the age of twenty-seven a syphilitic infection occurred. For the last eight years sexual incompetence had gradually increased, becoming marked during the last two years. The beard and the hair under the arms had disappeared at the onset of sexual incompetence. The patient was masculine in build. The testicles and penis were small. The basal metabolic rate was -31 per cent. Polydipsia and polyuria had existed for several years and the response to injections of pituitrin justified a diagnosis of diabetes insipidus. The findings of the cerebrospinal fluid were those of cerebrospinal syphilis. The analysis of the urine is shown in Table 4.

TABLE 4.

March.	Nitrogen, gm.	Creatinin, mg.	Creatin, mg.
5	7.67	1650	132.0
6	5.38	1347	73.6
7	6.85	1349	28.5
8	9.68	1518	52.8
9	3.23	555	49.5

CASE 4.—(A375931) R. N., aged thirty years, unmarried, had always been in good general health. Potentia and libido had never been present. His general build was feminine, with broad pelvis, narrow shoulders and a marked accumulation of fat in the breasts. He had no hair in armpits or on face, and it was sparse on the pubes. The testicles were pea-sized, and the penis about 2.5 cm. in length. The prostate was not palpable. His voice was high-pitched; he appeared to be about seventeen years of age. The analysis of the patient's urine is shown in Table 5.

TABLE 5.

July.	Nitrogen, gm.	Creatinin, mg.	Creatin, mg.
19	11.9	1422	154.0
20	7.4	1230	98.0
21	9.6	1430	91.0

CASE 5.—(A367481) J. K., aged fifty-one years, had always been in good general health. Following a gonorrhreal infection twenty-three years before, he had developed painful, chronic epididymitis, for which castration was performed four years before examination at the Clinic. He had been sexually normal, but after the operation libido and potentia were lost. The examination was negative except for moderate adiposity and evidences of a chronic prostatitis. The patient did not remain under observation long enough so that a twenty-four-hour specimen of urine could be obtained. The results of the analysis of two freshly voided specimens are shown in Table 6.

TABLE 6.

	Nitrogen, gm. for each 100 cc.	Creatinin, mg. for each 100 cc.	Creatin, mg. for each 100 cc.
Day specimen	2.48	322	15.9
Night specimen	3.89	247	6.3

CASE 6. (A375931) W. R. M., aged thirty-seven years, was unmarried, and had always been in good health. Libido and potentia had always been absent. He was very tall and thin, with narrow shoulders. He was well developed muscularly. He appeared youthful, and his voice was high-pitched. He had only a few hairs on the pubes and in the axillæ. The testicles were pea-sized and the penis very small. The basal metabolic rate was -10 per cent. The patient represented a typical picture of a eunuchoid giant. The analysis of the urine is shown in Table 7.

TABLE 7.

October.	Nitrogen, gm.	Creatinin, mg.	Creatin, mg.
29	10.78	1800	98
30	12.46	1896	147

The men (Cases 1 and 5) who were castrated at the ages of twenty-nine and forty-seven years respectively, excreted creatin. This is in contradistinction to the observations of Read, who asserts that creatinuria occurs only in eunuchs in whom castration is performed before sexual maturity. Analysis of the urine of three men with congenital testicular defects, and of one with a deficiency acquired at the aged of thirty-one, showed the presence of creatin regularly.

We had hoped to report a parallel series of cases with loss of libido and potentia, on a functional basis, and not dependent on an organic defect. Unfortunately, we had the opportunity to study only one such person. He had been healthy and normal sexually until July, 1921, when he discovered on one testicle a small swelling (spermatocele). After that, libido and potentia were wholly lost. The physical examination was negative. Creatin was not found in this patient's urine.

Discussion.—The creatin output varied markedly in the same patient from day to day and bore no relation to the total nitrogen and fairly constant creatinin values.

It is of interest to note that during the observation of Case 2, particularly high creatin values were obtained following the administration of thyroid extract for two days.

It is to be noted that all the cases were free from any condition with which creatinuria in man had been described, such as hyper-

thyroidism, diabetes mellitus, cachexia, disease of the liver, febrile disease, or primary and secondary myopathies.

Besides the sexual incompetence on an organic basis in Case 3, a diagnosis of diabetes insipidus was made. In view of the fact that creatinuria occurs in association with diseases of three other endocrine glands (thyroid, pancreas, and male gonad), it seems quite possible that the disturbance of the pituitary gland may have exerted additional influence in the production of the creatinuria.

BIBLIOGRAPHY.

1. Amberg, S.: Abt's System of Pediatrics. (Not yet published.)
2. Folin, O.: On the Determination of Creatinine and Creatine in the Urine. *Jour. Biol. Chem.*, 1914, **17**, 469-473.
3. Folin, O. and Denis, W.: Nitrogen Determinations by Direct Nesslerization. I. Total Nitrogen in Urine. *Jour. Biol. Chem.*, 1916, **26**, 473-488.
4. Read, B. E.: The Metabolism of the Eunuch. *Jour. Biol. Chem.*, 1921, **46**, 281-283.

A CLINICAL AND PATHOLOGICAL STUDY OF NEURITIS IN THE TROPICS, WITH SPECIAL REFERENCE TO BERIBERI.

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Introductory Note. This clinical and pathological study represents our crystallized opinions upon the principal problems connected with the subject, after prolonged residence in the tropics in teaching, research and practice.

No attempt is made to review the literature or to cover the practical field completely.

It is our aim to elucidate "Neuritis in the Tropics" rather than "Tropical Neuritis," and to clarify as much as may be this exceedingly difficult subject.

Of the problems of tropical pathology, that of neuritis is one of the most interesting, baffling and important. It is still very far from being solved.

The literature on the subject is enormous and much of it is of little value. Perhaps in no other field do we see so much uncontrolled, incomplete or unreliable work used as a basis for so many